NOTES

BRAYA GLABELLA VAR. *GLABELLA* (BRASSICACEAE) IN COLORADO.—*Braya glabella* Richardson var. *glabella* has been located in portions of the Sawatch Range and Elk Mountains. The first recognized collection for Colorado and the contiguous United States is: Colorado, Chaffee Co., Sawatch Range, Mineral Basin, approximately 30 km WSW of Buena Vista, 3685 m, 38°36′06″N, 106°23′45″W, 31 Jul 1987, *Siems 1592*. Additional collections include: Colorado, Chaffee Co., Sawatch Range, N-facing ridge, SE of Spout Lake, 4.8 km S of Cottonwood Pass, E of Continental Divide, 38°47″N, 107°24′29″W, 3750 m, 17 Aug 1985, *Neely 3170* (CS, RM; verified by J. Harris); Gunnison Co., Elk Mts., 0.5 km NW of American Flag Mountain, 1.4 km E of Stewart Mine, 38°56′10″N, 106°43′16″W, 3810 m, 24 Jul 1985, *Neely 3183* (CS, RM; verified by J. Harris); Elk Mts., ca. 0.8 km SE of Crystal Lake, Fossil Ridge, just NE of unnamed peak of 12,004 ft elev. (3659 m), 38°39′30″N, 106°37′41″W; 3658 m, 15 Aug 1985, *Neely 3174* (CS, RM; verified by J. Harris); Pitkin/Gunnison Co. line, Elk Mts., ridge S of Taylor Pass, 3870 m, 30 Jul 1984, *Mitchell 1698* (COLO); Elk Mts., ridge S of Taylor Pass, 3880 m, 10 Aug 1983, *Mitchell 1556* (COLO); Chaffee Co., Sawatch Range, Mineral Basin, approximately 30 km WSW of Buena Vista, 3685 m, 38°36′06″N, 106°23′45″W, 5 Aug 1988, *Weber et al. 17980* (COLO).

The most closely related species in Colorado is *Braya humilis* (C. Meyer) Robinson var. *humilis*. *Braya glabella* var. *glabella* differs from *B. humilis* in having scapose stems, with at most a single leaf or leafy bract subtending the lowermost flower or fruit, whereas *B. humilis* has leafy stems. The siliques are 3.5–8.3 times longer than broad in *B. glabella* var. *glabella* and 10–25 times in *B. humilis*. Fruits of the latter are linear, torulose, 9–29 mm long, and 0.6–1.2 mm wide. The siliques of *B. glabella* are oblong to narrowly oblong-lanceolate, occasionally torulose, 5–12 (–15) mm long, and 1.1–3 mm wide. Seeds are biseriate in *B. glabella* and uniseriate in *B. humilis*. (J. G. Harris, unpub. Ph.D. thesis, Univ. of Alberta, 1985).

In Mineral Basin, both *Braya* species occur in small patches of one to a few individuals separated by bare ground. Nearby species include *Erigeron leiomerus, E. compositus,* and *Antennaria aromatica*. In the adjacent Spout Lake Basin, *B. glabella* occurs alone, on loose rocks with sparse vegetative cover, associated with *Dryas octopetala, Carex rupestris, Oxytropis deflexa, Kobresia myosuroides,* and *Castilleja occidentalis*. Associates in the Crystal Lake and American Flag Mountain populations are similar, with additional species such as *Minuartia obtusiloba, Smelowskia calycina,* and *Physaria alpina*.

Braya glabella var. *glabella* is a North American lower arctic, sub-arctic, montane and alpine taxon, with most of its reported occurrences north of 60° latitude. It occurs in Alaska and in Alberta, British Columbia, Northwest Territories, Yukon, and Quebec in Canada. The distribution ranges south from the Canadian Arctic Archipelago through the Mackenzie and Rocky Mountains to Athabasca Glacier and Cardinal River, Alberta, west to Seward Peninsula, Alaska, and east to Hudson Bay (Harris 1985). The most northerly occurrence is on Banks Island in Northwest Territories (at approximately 74°N). Its distribution is somewhat similar to the North American distribution of *B. humilis*. However, *B. glabella* var. *glabella* is reported from fewer locations, does not extend as far north, and is apparently absent on the southwest side of Hudson Bay, where *B. humilis* is not infrequent. Throughout its North American range, *Braya humilis* is believed to be exclusively or nearly exclusively associated with calcareous substrates. In Canada, *Braya glabella* often occurs on calcareous barren soils and gravels on gravel bars, disturbed sites, lake and seashores, scree slopes, and solifluction lobes (Harris 1985).

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The closest previous *Braya glabella* var. *glabella* record is from an estimated 53°N latitude in Jasper National Park, Canada (Harris 1985), approximately 1800 km north of the Colorado populations. The Colorado collections represent a greater distance of disjunction than do the Colorado *B. humilis* populations (disjunct from populations in Waterton Lakes Park, Alberta).

In the Colorado alpine only five small populations of *Braya glabella* are known, and these are spread through three counties and two mountain ranges (the Elk Mountains and the Sawatch Range). *Braya humilis* var. *humilis* is know from about 20 populations in 10 locations in four mountain ranges in Colorado (the Tenmile, Mosquito, Sawatch, and Elk ranges).

The two species appear to be ecologically very similar. In Colorado *Braya humilis* var. *humilis* is restricted to calcareous soils associated with the Paleozoic Leadville Limestone and Manitou Dolomite (Neely and Carpenter, Great Basin Naturalist 46: 728–735, 1986). Typical habitats include solifluction lobes, low angle talus slopes, and gravel associated with minor amounts of soil movement, as well as man-made disturbances, usually mining associated. In Mineral Basin, *B. glabella* var. *glabella* occurs with *B. humilis* in highly calcareous, disturbed, inorganic mineral soil. The populations occur below a 320-meter thick section of Paleozoic limestones and dolomites which form cliffs and moderately steep to steep, stable and unstable talus slopes. Although the sampled population occurs in association with material disturbed by mining activities within the last century, source populations probably occur on the naturally disturbed area upslope. One collection (*Mitchell 1698*) is described as being from granite talus, but the same Paleozoic carbonate formations are known to occur in the area and may have contributed to the soil. With that one doubtful exception, *B. glabella* var. *glabella* in Colorado is always found on calcareous substrates derived from Mississippian Leadville Limestone, with or without materials derived from other Paleozoic calcareous formations. It occurs at or above 3658 m, on sparsely vegetated slopes above timberline, with fine gravels, or on disturbed sites associated with inactive mines.

The area encompassing Mineral Basin and Spout Lake is potentially comparable to Horseshoe Basin, noted by Weber and Argus (Madroño 33:148–9, 1986) as being "part of the most critical floristic site in the state" because of its extensive exposures of alpine limestone. Such limestone outcrops characterize this area also. Available habitats include broad expanses of calcareous talus, stabilized talus/fan deposits, exposed ridgetops, two lake shores, perennially wet turf, and springs. Both north- and south-facing basins occur. Especially notable is the expanse of south-facing cliffs, unstable talus, and frost-disturbed slopes. Much of this area would have been above any glaciers filling the cirque basin. The steepness and south-facing aspect make a potentially ideal refuge for disturbance-adapted calciphilous species during Pleistocene full-glacial times. Harris (1985) suggests that such unglaciated areas were of primary importance in the survival of *Braya* species in many areas of northern North America because these species lack long distance dispersal mechanisms and are almost entirely restricted to calcareous soils. Several new carbonate associated species have been reported in Colorado in recent years, including *Antennaria aromatica, Chondrophylla nutans, Salix lanata* subsp. *calcicola,* and now, *B. glabella* var. *glabella.* It is possible that other disjunct species occur within the estimated 2 km^2 area of Paleozoic carbonate units where Mineral Basin and Spout Lake are located.

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